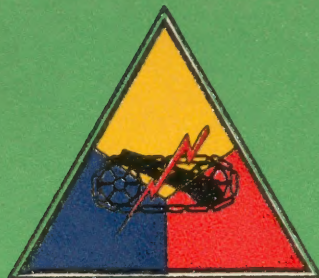


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ARMORED MEDICAL RESEARCH LABORATORY

FORT KNOX, KENTUCKY

INDEXED

PROJECT NO. 3 - TOXIC GASES IN ARMORED VEHICLES

Supplemental Report On

Sub-Project No. 3-12 - The Carbon Monoxide Hazard from Auxiliary
Generators in Tanks

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Project No. 3-12

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April 2, 1943

ARMORED FORCE MEDICAL RESEARCH LABORATORY
Fort Knox, Kentucky

Project No. 3-12
File No. 723.13-1 GNOML

April 2, 1943

Supplemental Report On

CARBON MONOXIDE HAZARD FROM AUXILIARY GENERATORS IN TANKS

1. PROJECT: No. 3-12, Determination of the Carbon Monoxide Hazard from Auxiliary Generators in Tanks.

a. Authority - Letter Commanding General, Headquarters Armored Force, Fort Knox, Kentucky, 400.112/6 GNOHD, dated September 24, 1942.

b. Purpose - To determine the magnitude of the carbon monoxide hazard resulting from operation of auxiliary generators in tanks when the tank motor is not running.

2. DISCUSSION:

a. Methods. This report is a supplement to the report on M4 medium tanks, dated December 20, 1942, and covers the findings on three additional tanks: the M4A4, the M5A1 and the M7.

b. Carbon monoxide concentrations were determined at three points inside the tank during operation of the auxiliary generator: at an opening in the bulkhead and at the breathing zones of the loader and driver. In each case the tank was located in an open yard and oriented so as to provide a tail wind. The tank was buttoned up and the engine not running.

c. All tests were made without modifications in the location of the exhaust line from the auxiliary generator.

3. CONCLUSIONS:

a. Diffusion of carbon monoxide throughout the fighting compartment occurs rapidly so that the concentration in the bow is only slightly lower than in the turret.

b. M4A4.

(1) Operation of the auxiliary generator in the M4A4 tank when the tank engine is not running produces hazardous concentrations of carbon monoxide in the fighting compartment. (Fig. 1)

c. M5A1 and M7.

(1) The carbon monoxide concentrations found in the fighting compartments of these tanks, in the present tests, could be tolerated without danger for from one-half to one hour. The data indicate that a potential hazard exists. (Figs. 2 and 3)

THE UNIVERSITY OF CHICAGO
DIVISION OF THE PHYSICAL SCIENCES
DEPARTMENT OF PHYSICS
CHICAGO, ILLINOIS 60637

TO THE EDITOR:
I am writing to you to inform you of the results of my recent experiments on the effect of temperature on the rate of reaction between hydrogen peroxide and potassium iodide.

The results of my experiments show that the rate of reaction increases as the temperature increases. This is in agreement with the general principle that the rate of reaction increases with increasing temperature.

I have conducted a series of experiments in which the temperature of the reaction mixture was varied from 10°C to 30°C. The rate of reaction was measured by the volume of oxygen gas evolved over a fixed period of time. The results of these experiments are shown in the table below.

As you can see from the table, the rate of reaction increases significantly as the temperature increases. This is due to the fact that the molecules of the reactants have more kinetic energy at higher temperatures, and therefore they are more likely to collide with sufficient energy to undergo a chemical reaction.

I am sure that these results will be of interest to you, and I am sure that you will find them to be in good agreement with the general principles of chemical kinetics.

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4. RECOMMENDATIONS:

a. Extend the exhaust pipe from the auxiliary generator in the M4A4, M5A1 and M7 tanks so as to discharge beyond the rear wall of the engine compartment, in accordance with the recommendations of the report dated December 20, 1942.

b. Construction and maintenance of the exhaust line should be adequate to prevent direct leakage of exhaust gases into the fighting compartment.

c. Whenever possible, the hatches should be open during operation of the auxiliary generator with the tank motor not running.

Submitted by:

Capt. Norton Nelson, Sn-C
Mr. Sgt. T. C. Swigert

APPROVED

Willard Machle

WILLARD MACHLE

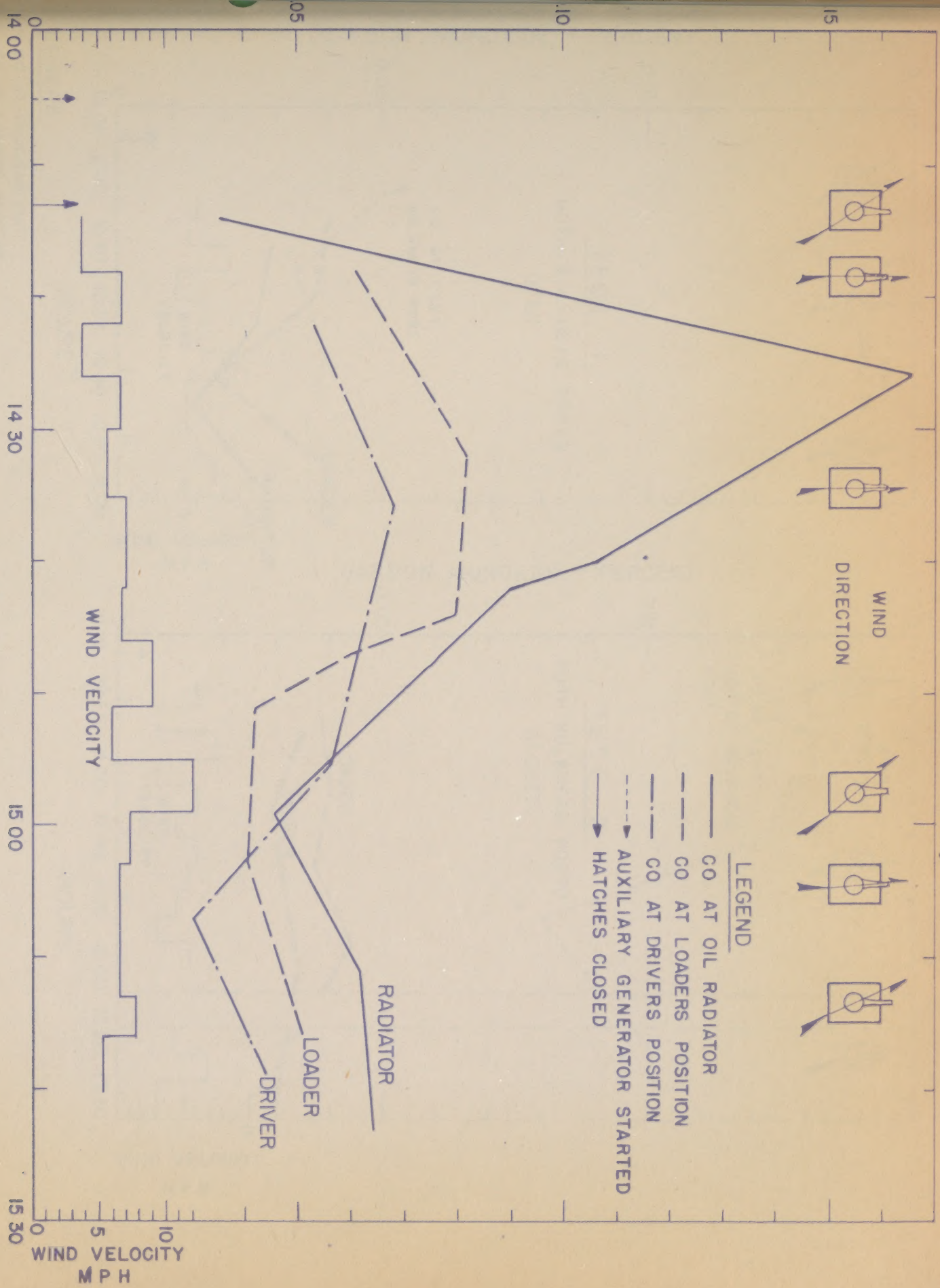
Lt. Col., Medical Corps,
Commanding.

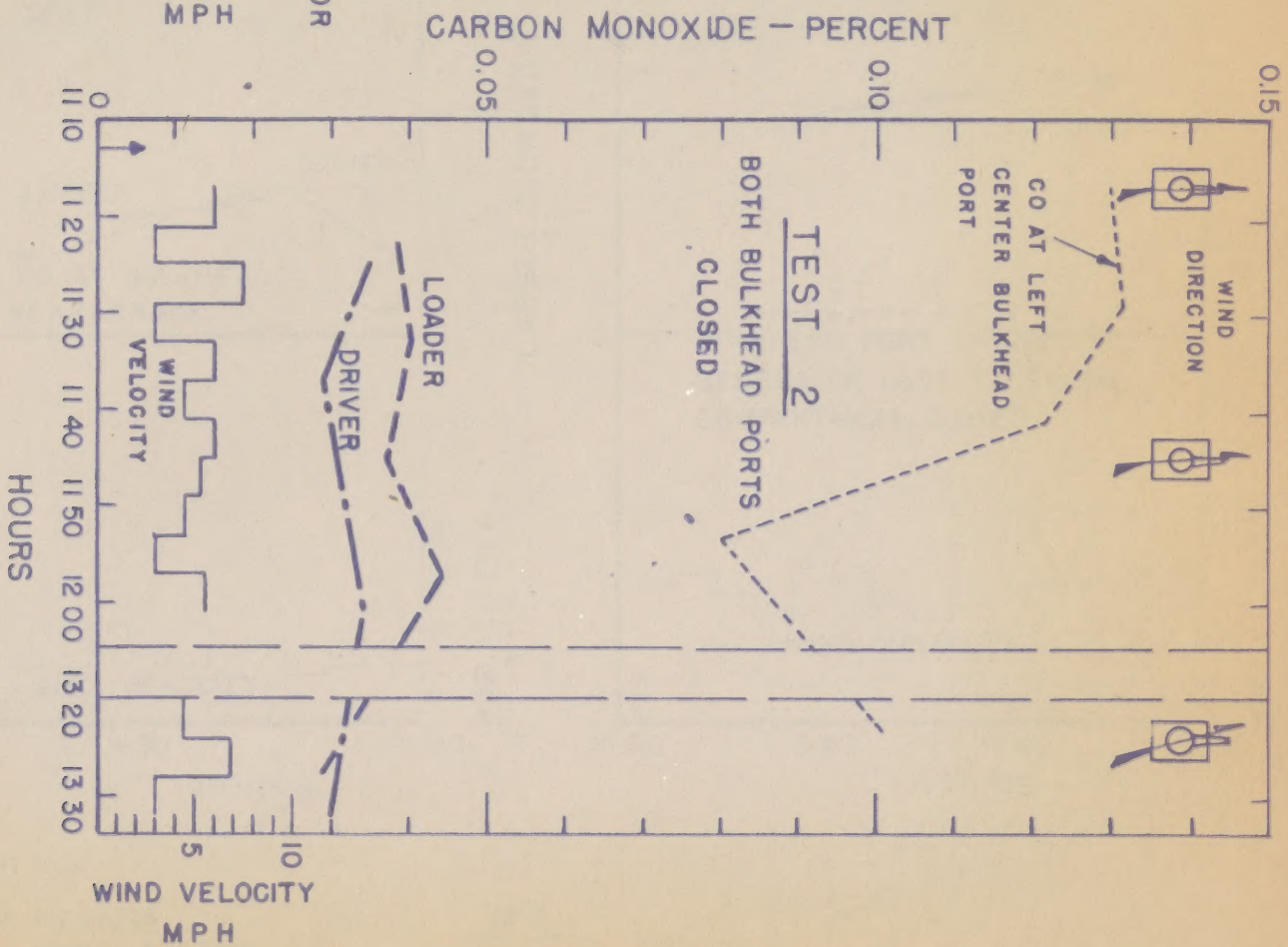
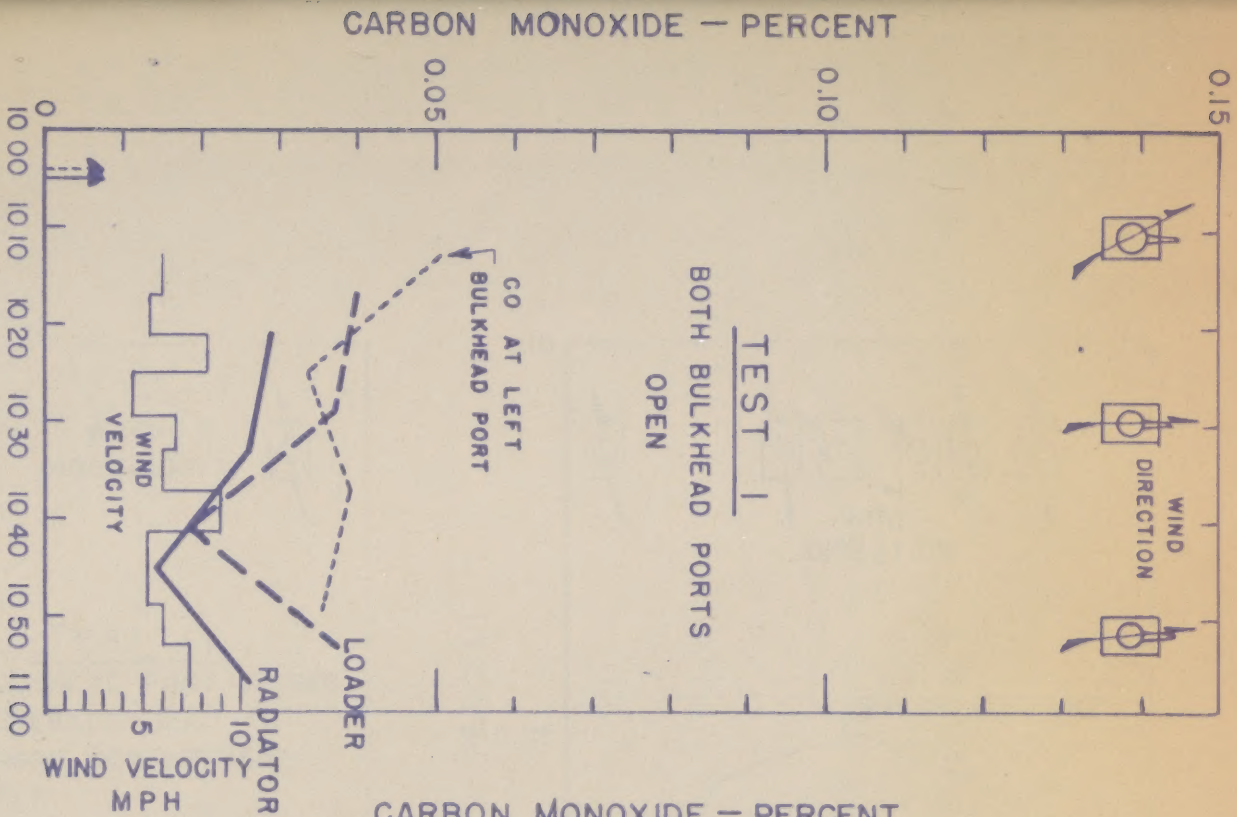
3 Incls.

#1 - Fig. 1

#2 - Fig. 2

#3 - Fig. 3





LEGEND

CO AT BULKHEAD PORT

CO AT LOADERS POSITION

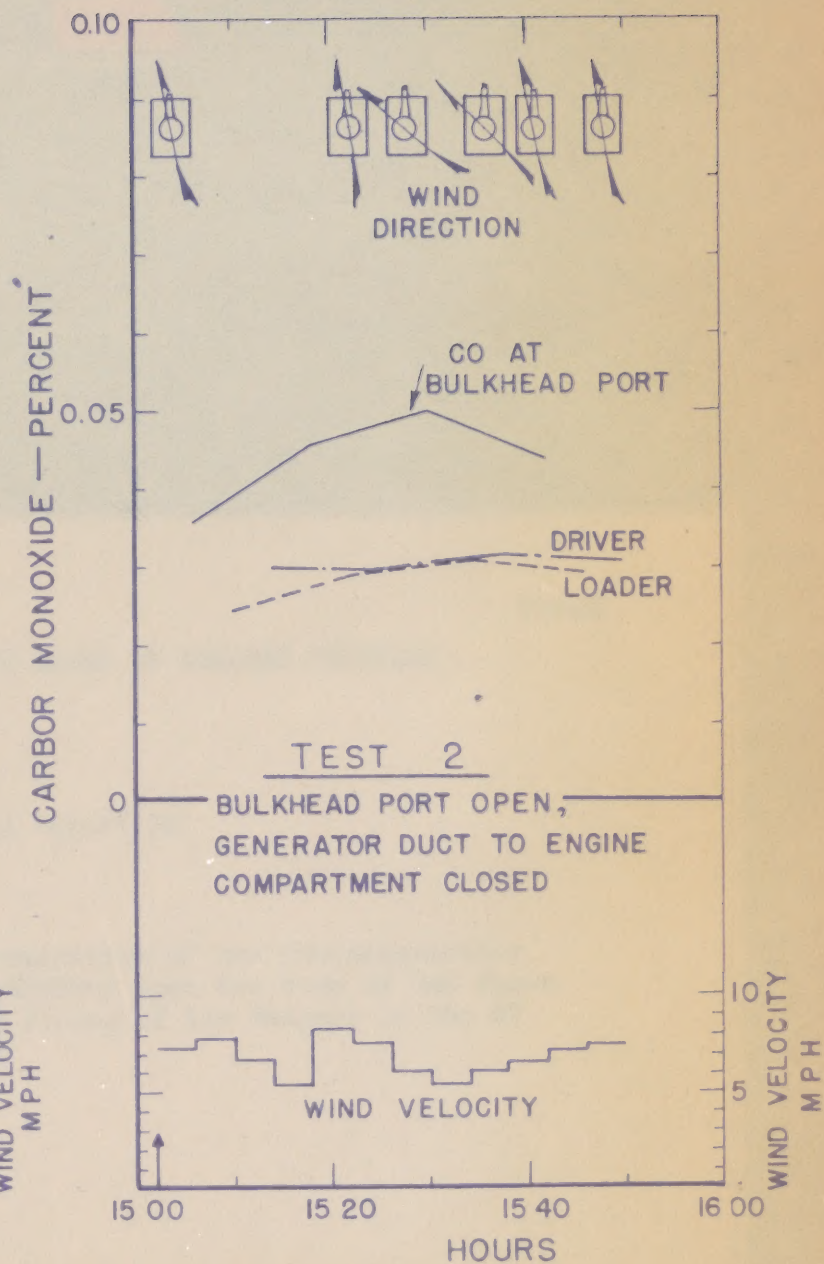
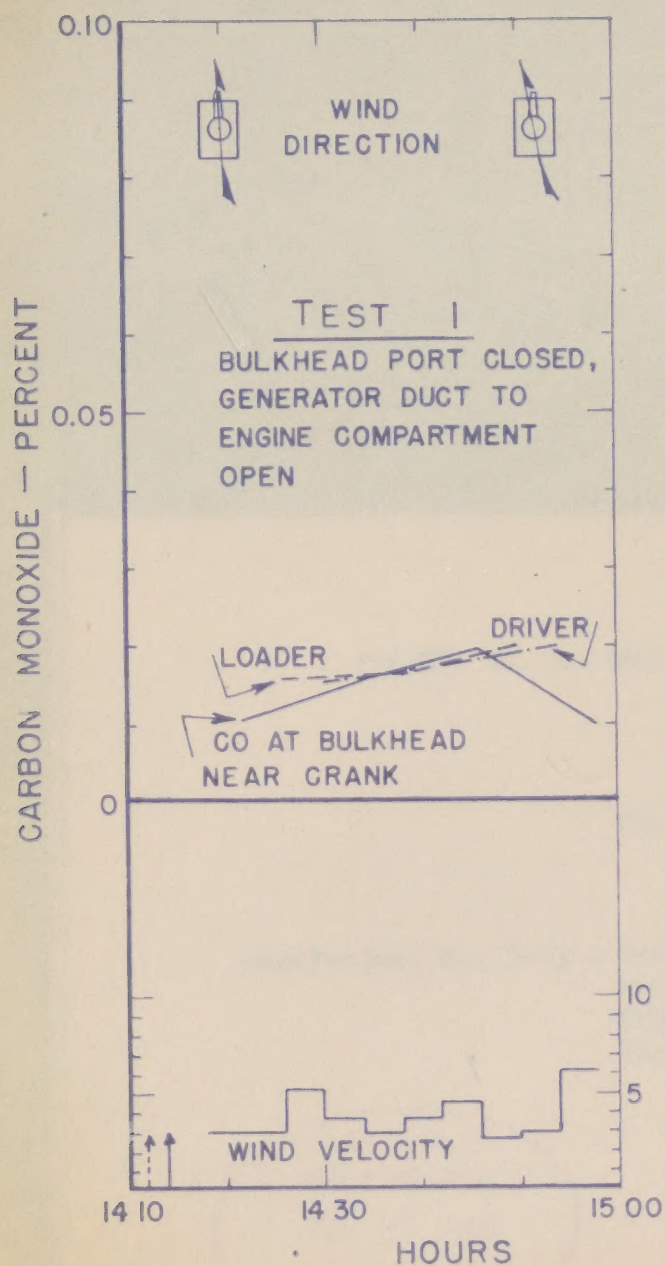
CO AT DRIVERS POSITION

AUXILIARY GENERATOR STARTED

HATCHES CLOSED

M5A1

FIG. 2



LEGEND

- CO AS INDICATED
- - - CO AT LOADER POSITION
- · - CO AT DRIVERS POSITION
- - - - - AUXILIARY GENERATOR STARTED
- > HATCHES CLOSED

M7

FIG. 3

1. The first of these is the
 2. the second is the
 3. the third is the
 4. the fourth is the
 5. the fifth is the

